

a magnetic recording layer on the substrate and comprising a first ferromagnetic layer having a magnetic moment per unit area, a non-magnetic coupling layer on the first ferromagnetic layer, and a magnetic layer having a magnetic moment per unit area different from the moment per unit area of the first ferromagnetic layer and being formed on the non-magnetic coupling layer, the magnetic layer being exchange coupled anti-ferromagnetically to the first ferromagnetic layer across the non-magnetic coupling layer, the magnetic recording layer exhibiting a major hysteresis loop with two remanent magnetic states in the absence of an applied magnetic field; and

wherein the orientations of the moments of the first ferromagnetic layer and the magnetic layer are substantially antiparallel in each remanent state, but the moment orientation in one remanent state of at least one of the first ferromagnetic layer and the magnetic layer is substantially antiparallel to its orientation in the other remanent state.

27. (New Claim) The magnetic recording medium as claimed in claim 26, further comprising:

a second non-magnetic coupling layer below the first ferromagnetic layer; and
a second ferromagnetic layer below the second non-magnetic coupling layer, the second ferromagnetic layer being exchange coupled anti-ferromagnetically to the first ferromagnetic layer across the second non-magnetic coupling layer.

wherein:

28. (New Claim) The magnetic recording medium as claimed in claim 26,

the first ferromagnetic layer has a thickness t_1 and a magnetization M_1 , and

the magnetic layer has a thickness t_2 and a magnetization M_2 ,

wherein the magnetic moments per unit area ($M_1 \times t_1$) and ($M_2 \times t_2$) of the first ferromagnetic layer and the magnetic layer, respectively, are different from one another.

29. (New Claim) The magnetic recording medium as claimed in claim 26,

wherein the non-magnetic coupling layer is formed of a material selected from a group consisting of Ru, Rh, Ir, and their alloys.

30. (New Claim) The magnetic recording medium as claimed in claim 26,

wherein the first ferromagnetic layer is formed of a material selected from a group consisting of Co, Fe, Ni, and their alloys and the magnetic layer is formed of a material selected from a group consisting of Co and its alloys.

31. (New Claim) The magnetic recording medium as claimed in claim 26,

further comprising an underlayer located between the substrate and the magnetic recording layer.

32. (New Claim) The magnetic recording medium as claimed in claim 26, further comprising a protection layer formed over the magnetic recording layer.

33. (New Claim) A magnetic recording medium comprising:
a substrate;
an underlayer above the substrate; and
a magnetic recording layer above the underlayer and comprising a first Co alloy ferromagnetic layer having a magnetic moment per unit area and comprising multiple magnetic domains with orientations of the domains being generally randomly oriented in-plane, a non-magnetic coupling layer of a material selected from a group consisting of Ru, Rh, Ir, and their alloys formed on and in contact with the first Co alloy ferromagnetic layer, and a Co alloy magnetic layer having a magnetic moment per unit area different than the magnetic moment per unit area of the first Co alloy ferromagnetic layer and comprising multiple magnetic domains, the Co alloy magnetic layer being formed on and in contact with the non-magnetic coupling layer, the non-magnetic coupling layer having a thickness sufficient to induce domains of the Co alloy magnetic layer to be exchange coupled anti-ferromagnetically to associated domains of the first Co alloy ferromagnetic layer across the non-magnetic coupling layer with the orientations of the moments of the domains in the Co alloy magnetic layer being substantially antiparallel to the orientations of the moments of their associated domains in the first Co alloy ferromagnetic layer.

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34. (New Claim) The magnetic recording medium as claimed in claim 33, further comprising:

a second non-magnetic coupling layer formed below and in contact with the first Co alloy ferromagnetic layer; and

a second ferromagnetic layer formed below and in contact with the second non-magnetic coupling layer;

the thickness of the second non-magnetic coupling layer being sufficient to induce the second ferromagnetic layer to be exchange coupled anti-ferromagnetically to the first Co alloy ferromagnetic layer across the second non-magnetic coupling layer.

35. (New Claim) The magnetic recording medium as claimed in claim 33, wherein:

the first Co alloy ferromagnetic layer has a thickness t_1 and a magnetization M_1 ; and

the Co alloy magnetic layer has a thickness t_2 and a magnetization M_2 ,

wherein the magnetic moment per unit area ($M_1 \times t_1$) and ($M_2 \times t_2$) of the first Co alloy ferromagnetic layer and the Co alloy magnetic layer, respectively, are different from one another.